Summary of the Statement of Stephen L. Oesch,
Insurance Institute for Highway Safety, on May 22, 1997
Before the Subcommittee on Telecommunications, Trade, and Consumer Protection

The National Highway Traffic Safety Administration (NHTSA) addresses one of the largest public health problems facing our country — motor vehicle deaths and injuries. Crashes are the number one cause of death among people 1 to 34 years old. Crashes also result in more than 500,000 hospital admissions annually. They are the leading cause of head, brain, and spinal cord injuries, which are especially debilitating and costly to treat. The costs of emergency services, medical treatment, and rehabilitation services needed because of crash injuries are important factors in the increasing cost of health care.

The resources — especially research funds — available for NHTSA to achieve its regulatory mandate simply are not commensurate with the size of the burden of motor vehicle crash injuries. NHTSA still has managed to improve highway safety, especially vehicle safety. Federal motor vehicle safety standards have significantly reduced crash injuries and deaths. Now improvements in agency programs are needed to continue making progress. Three areas are singled out for attention:

1. The National Automotive Sampling System (NASS) originally was scheduled to involve teams investigating crashes in 75 locations nationwide, but only 24 locations are included. Approximately 5,000 crashes are investigated annually — an inadequate sample for many applications. For example, it takes too many years for key questions about the effectiveness of various safety features to be addressed. Because NASS is so critical to our understanding of crash problems, additional funding is needed to increase the current number of crashes being investigated. Data also should be made more readily available.

2. NHTSA has begun a process that could lead to harmonizing federal motor vehicle safety standards with international standards. The Institute supports the concept of harmonizing the performance requirements of U.S. standards with the best practices worldwide, beginning with the adoption of European head restraint requirements in the United States and reconciliation of differences between U.S. and proposed European side impact standards.

3. Some intelligent transportation system (ITS) technologies could be used to address needed airbag improvements — in particular, sensor and inflator improvements. These airbag applications are more promising than the applications for which the ITS technologies are intended.

Statement Before the U.S. House of Representatives Committee on Commerce, Subcommittee on Telecommunications, Trade, and Consumer Protection

National Highway Traffic Safety Administration Reauthorization

Stephen L. Oesch

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INSURANCE INSTITUTE FOR HIGHWAY SAFETY

The Insurance Institute for Highway Safety is a nonprofit research and communications organization, sponsored by auto insurers, that identifies ways to reduce motor vehicle crashes and crash losses. I am the Institute's senior vice president, and I am here to discuss ways to improve National Highway Traffic Safety Administration (NHTSA) programs.

In assessing NHTSA's regulatory performance, it is important to keep in mind that the agency's mission addresses one of the largest public health problems facing our country — motor vehicle deaths and injuries. Crashes are the number one cause of death among people 1 to 34 years old. Crashes cause more than 20 percent of the deaths of young people 5 to 29 years old and more than 30 percent of the deaths of people in their late teens.

Deaths are not the only problem. Motor vehicle crashes result in more than 500,000 hospital admissions annually. Crashes are the leading cause of head, brain, and spinal cord injuries, which are especially debilitating and costly to treat. The costs of emergency services, medical treatment, and rehabilitation services needed because of motor vehicle crash injuries are important factors in the increasing cost of health care in the United States.

The resources — especially research funds — available for NHTSA to achieve its regulatory mandate simply are not commensurate with the size of the burden of motor vehicle crash injuries. According to the latest report from the Bureau of Transportation Statistics, motor vehicle injuries represent 98 percent of all transportation injuries and 96 percent of all transportation fatalities. Yet NHTSA funding accounts for less than 1 percent of the Department of Transportation's fiscal 1997 budget. The federal government spends more money every year on dental research, for example, than on NHTSA research aimed at reducing motor vehicle deaths and injuries. In fiscal 1996, the National Institutes of Health spent more than $180 million on dental research compared with NHTSA's total research budget for the same period of only $31 million.

NHTSA funding for key items, such as research on the biomechanics of injuries, falls far short. The agency has less than $7.5 million to spend in fiscal 1997 on biomechanics research — too little given the importance of such work. It is crucial right now because some of the problems with existing airbags are due, in part, to inadequate knowledge about injury mechanisms for infants, children, and elderly people.

Despite the enormity of its task and the lack of adequate resources, NHTSA still has managed to improve highway safety, especially vehicle safety. Federal motor vehicle safety standards have significantly reduced crash injuries and deaths. Nevertheless, improvements in agency programs are needed to continue making progress.

More Crash Data Needed, and Distribution Should Be Improved

One key to reducing deaths and injuries on our highways is the availability of good, comprehensive data to identify the driver, vehicle, and environmental factors contributing to crashes and crash-related injuries. In 1979, NHTSA implemented the National Accident Sampling System, now called the National Automotive Sampling System (NASS). Its purpose is to collect crash data by investigating crashes in depth. Special emphasis is on occupant protection in passenger vehicle crashes.

Originally scheduled to involve teams investigating crashes in 75 locations nationwide, NASS includes only 24 locations. Approximately 5,000 crashes are investigated annually — an inadequate sample for many applications. It takes too many years for key questions about the effectiveness of various safety features to be addressed, for example. Because NASS is so critical to our understanding of motor vehicle crash problems, additional funding is needed to increase the current number of crashes being investigated.

The advantage of NASS is its detail. It goes far beyond typical police reports of crashes to identify the specific vehicle features that contribute to occupant injuries. It includes data not only from police reports but also from crash investigations, measurements and photographs of vehicles, medical records, vehicle records, and interviews with survivors. From this, researchers are able to obtain much more information than is available from any other source to analyze crashes. For example, the Institute recently compared two federal databases of information about collisions during 1988-93 in which passenger vehicles slid beneath trucks in underride crashes. The first database used was the Fatal Analysis Reporting System (FARS) because this is the standard source of incidence counts of fatal crashes. It includes data from police reports as well as from vehicle registration and driver records. Institute researchers also examined information from the more comprehensive NASS files. In comparing the two, researchers found that FARS substantially underestimates the number of underride crashes. Of the 275 fatal truck-car crashes

included in both databases, NASS coded 27 percent as underrides compared with only 7 percent in FARS. Of the 75 crashes coded in NASS as underrides, only 18 were identified as such in FARS.

In addition, NHTSA should take steps to make the data from NASS and other systems available on a more timely basis. At present, researchers must file requests for NASS data with a private contractor hired by NHTSA to store these data and then wait months for a request to be filled. Such delays prevent the early identification of emerging safety problems. NHTSA therefore should make all of its crash investigations — including photos and copies of field reports — electronically available (the agency already is doing this with 1997 NASS data). Then the Institute, vehicle manufacturers, and other researchers will be able to quickly identify new injury trends and take steps to develop countermeasures.

Harmonizing Safety Standards Worldwide

NHTSA has begun a process that could lead to harmonizing federal motor vehicle safety standards with international standards. The Institute supports the concept of harmonizing the performance requirements of U.S. standards with the best practices worldwide. We agree with Administrator Ricardo Martinez's comments at the Transatlantic Automotive Industry Conference, when he pointed out that the challenge is to assure "no degradation of the safety provided by a regulation in the process of achieving harmonization." The goal should be worldwide adoption of best practices — not adoption of the lowest common denominator.

An excellent starting place for harmonization would be the head restraint standard (Federal Motor Vehicle Safety Standard 202). The Institute recently completed an evaluation of the head restraints in more than 200 passenger vehicles sold in the United States, finding that only 5 of these vehicles have head restraints with good geometry. We rated more than half of the restraints as poor. A problem is that present U.S. head restraint requirements, unchanged since 1969, are woefully inadequate. For a head restraint to offer protection, it must be high enough so it is positioned behind and close to the back of an occupant's head. Minimum requirements specify an adjusted height of at least 27.5 inches but set no minimum for adjustable restraints in their lowest positions. Nor do the requirements specify how close a restraint must be to the back of the head.

The new European standard sets a minimum height of 29.5 inches for head restraints in their lowest, or down, positions — higher than the U.S. requirement for head restraints in their fully up positions — and an adjusted height that exceeds 31.5 inches. Because adjustable head restraints usually are left in their down positions, this European rule is better for many occupants. And because the European standard also specifies a higher minimum height requirement for head restraints in their fully up positions, it is better for taller occupants in particular.

Adopting the European requirements in the United States would be a win-win for everyone. Vehicle manufacturers could begin incorporating European designs in a wider variety of vehicles without developing different designs for U.S. vehicles, and the motoring public would benefit from this first step toward improved protection against neck injuries. The next step would be for both European and U.S. standards to specify how close head restraints should be to occupants' heads.

Harmonization also would be appropriate to address the problem that safety standards designed to achieve the same benefits may involve different requirements in different countries. This can lead to vehicle designs that may perform well when measured by one country's standard but not so well when measured by another's. Such is the case with U.S. and European side impact standards, for example. When the U.S. standard was adopted, it was widely recognized as a compromise because of continuing debate about the adequacy of the test dummy and injury criteria. It was expected that NHTSA would adopt dummy improvements and additional injury criteria, but that has not happened. The future European and the existing U.S. side impact standards now have different dummies. The U.S. rule uses SID while Europe will use EuroSID. The standards also have different injury criteria — an acceleration-based thoracic trauma index in the United States and a compression-based injury criterion in Europe — and different crash test barriers.

At the time NHTSA issued its most recent side impact standard, it said it would begin new rulemaking to determine whether to incorporate one or more of the two existing alternative dummies — BioSid and EuroSID. But after issuing a request for comments in December 1991, NHTSA terminated the rulemaking in April 1993, saying there is a "need for substantially broader technical bases to justify further rulemaking." Now more than four years later,

NHTSA has yet to take further action. Unfortunately, this is typical when a new standard is issued and technology continues to advance. Rather than moving aggressively to improve the standard, the agency and motor vehicle manufacturers are content to live with an existing rule even though it is outdated. NHTSA should move forward quickly to harmonize U.S. and proposed European side impact standards.

Intelligent Transportation Systems and 'Smart' Airbags

While intelligent transportation systems (ITS) have been justified as safety programs, their potential safety benefits have been exaggerated. In fact, the principal focus of ITS is reducing traffic congestion, not saving lives. The safety-oriented research has involved ways to reduce the frequency of certain kinds of crashes. The idea is that crashes could be prevented if drivers were provided with information in sufficient time to enable appropriate evasive action. But this is based on two dubious assumptions — that drivers need or want earlier information about, for example, following too closely and that it is possible to give drivers useful information with sufficient time (realistically at least half a second) and in a way that facilitates appropriate evasive action. Given the complications, both technological and legal, to be overcome, it is likely to be a long time, if ever, before such collision avoidance systems will be practical.

However, some ITS technologies could be useful in the shorter run to address airbag improvements. The basic question is, how can future airbag systems be designed to protect people in severe crashes without injuring out-of-position occupants in the much more common low severity crashes? Both airbag sensors and inflator technology need to be improved, and shifting some ITS research funds could help.

Serious airbag inflation injuries can occur when occupants are on top of, or very close to, an airbag when it first begins to inflate. It is the energy involved in rapidly inflating airbags that produces these injuries so, if the energy could be reduced, then the injury risk also would be reduced. However, there is a limit to how much the current energy of airbags could be reduced while still providing protection in high-speed crashes. To provide effective protection, airbags must fully inflate before occupants, both belted and unbelted, have moved very far forward. This dictates the time in which inflation must be complete, and the time when inflation begins is determined by airbag sensor technology. The earlier inflation

begins, the lower the energy needed to inflate a bag because the total time available for inflation is longer. Thus, airbag inflator energy levels are constrained by the time it takes crash sensors to signal inflation to begin.

The job of airbag crash sensors is to estimate the ultimate severity of a crash as early as possible and then signal airbags to deploy if they are needed. But this is complicated by the fact that different kinds of crashes have very different characteristics. A high-speed crash into a rigid barrier is relatively short in duration and characterized by high accelerations throughout. An even higher speed crash into a parked car takes longer than a barrier crash, but the early part of such a collision can be similar to the beginning of a relatively low severity crash. The sensors in today's airbags take longer to recognize the ultimate severity of a crash into a parked car than they would to recognize an impact of equivalent severity into a rigid object. In many real-world crashes into softer objects like the rear-ends of other cars or into narrow objects like trees or poles, crash sensors take longer to recognize whether airbags are needed. This can result in later deployments than are desirable because occupants may have moved forward into a zone where the deploying bags could harm them.

At the same time, sensors can "mistake" some minor crashes, like a low-speed bump into a wall, as the early stages of much more severe crashes. This can lead to unnecessary airbag inflations in some low severity crashes in order to assure deployment in more serious crashes into softer or narrower objects. The net result is that today's sensors sometimes signal airbag deployments in low severity crashes (delta Vs 8-9 mph) in order to assure that airbags always inflate in more severe crashes (delta Vs 13-15 mph).

Two kinds of technological advances could mitigate this problem. One approach would be to use information from some of the ITS collision avoidance systems to supplement crash sensor information. Such use of precrash information offers the possibility of reliable identification of crashes in which airbags are needed much earlier than is possible through crash sensing alone. This represents a really promising application of ITS sensing technology — much more promising than the collision avoidance application because, unlike the half second (at least) warning needed to avoid a crash, the added time needed for reliable information to improve airbag crash sensing is just a few milliseconds.

A longer term approach involves exploring whether ITS collision warning systems could be adapted to reliably predict crashes before they happen — a potential use foreseen in the first edition of the National ITS Program Plan (1995). Such systems might predict crashes and their severity with enough precision that airbags could begin to deploy milliseconds before a crash has started. This would greatly reduce the energy needed for inflation.

Another area in which ITS expertise could help involves evaluation procedures for new crash sensors. Today, data from a limited range of crash tests are used to evaluate sensor performance. There is a need for a more extensive range of crash tests, but these would be prohibitively expensive to conduct for every vehicle model. Supercomputers and advanced techniques could be used to develop computer models for a much greater range of crash configurations than currently are available. These models also could include a range of possible precrash events. They could be adapted for individual vehicles so that a more comprehensive evaluation of airbag sensing technologies would be possible without having to run huge numbers of crash tests.

Besides airbag sensors, the inflators could benefit from ITS research and technology. Today's airbag inflators are overwhelmingly based on sodium azide. The disadvantage is that, once the sodium azide begins to burn, it burns at one speed. Its energy output cannot be controlled. Although some manufacturers have used multiple sodium azide inflators with programmed time intervals between firing to greatly reduce airbag force at initial deployment, other technologies may offer better solutions and in some cases could, for example, shut off airbag inflation altogether if sensors subsequently were to determine that additional inflation is not needed.

Alternatives to sodium azide inflators may not be receiving sufficient development and evaluation funding because the airbag supply industry has a significant investment in the sodium-azide based approaches. This is where ITS technologies and capabilities could help. Precrash sensing could significantly increase the available time to deploy airbags, and real-time control of inflator energy output could permit the use of precrash, crash, and occupant sensors to optimize airbag deployment characteristics. These appear to be achievable goals in the short term, given sufficient research and development resources. They would be a good direction for ITS safety research.

Summary and Conclusions

NHTSA's mission is important because the cost of motor vehicle crashes is so high in terms of both lives and dollars. Given this burden, it's important to boost NHTSA resources, especially the funds available for research. In particular, the National Automotive Sampling System should be expanded and its data made more readily available. Also important is harmonizing motor vehicle safety standards to the best practices worldwide and redirecting some ITS research funding to applications that might improve present airbag technology. These steps would help NHTSA keep making progress in its crucial mission of saving lives on the nation's highways.

Biographical Sketch

Stephen L. Oesch

Stephen L. Oesch is a senior vice president of the Insurance Institute for Highway Safety, a nonprofit research and communications organization dedicated to reducing the losses resulting from motor vehicle crashes. The Institute is funded by automobile insurers.

Oesch has worked on a variety of highway loss reduction programs including efforts to upgrade federal safety standards for motor vehicles and to implement new traffic laws and enforcement programs aimed at reducing alcohol-impaired driving. Prior to joining the Institute, he was an attorney at the U.S. Department of Transportation's National Highway Traffic Safety Administration.

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